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A CALIFORNIAN ARBORETUM

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FORTY years ago Governor Stanford purchased the Palo Alto ranch, now the site of Stanford University, and established his residence there. Shortly afterward, he conceived the idea of developing an arboretum in which might be found all of the trees and shrubs which could be grown in what is an exceptionally favorable region, even for California.

To this end a tract of about one hundred and sixty acres was set aside, and extensive plantings were made; but unfortunately whoever was responsible for the original planting evidently did not entirely appreciate the needs of many of the species that were selected, and consequently very many of these have not survived the vicissitudes to which the arboretum has been subjected since it was first laid out. For instance, a large number of trees from the Atlantic States were planted, without realizing that they are not at all adapted to withstand the long dry summer of California, and consequently the greater part of these have disappeared and the few that have survived have made very little growth.

On the other hand, many of the native species, and those from Australia and other countries similar in climate to California, not only have survived, but some of them have developed into superb specimen trees, and the arboretum at present contains magnificent examples of many notable native and exotic trees and shrubs.

For many years after Governor Stanford's death in 1893, conditions, financial and otherwise, made it impossible to develop the arboretum along the lines laid down by the founder. Recently, however, the trustees of the university have decided to continue the development of the arboretum, and have made provision for the acquisition of new plants, and the care of these.

The selection of the trees and shrubs and the general supervision of their planting and maintenance has been delegated to the department of botany of Stanford University, and it is hoped thus before long a

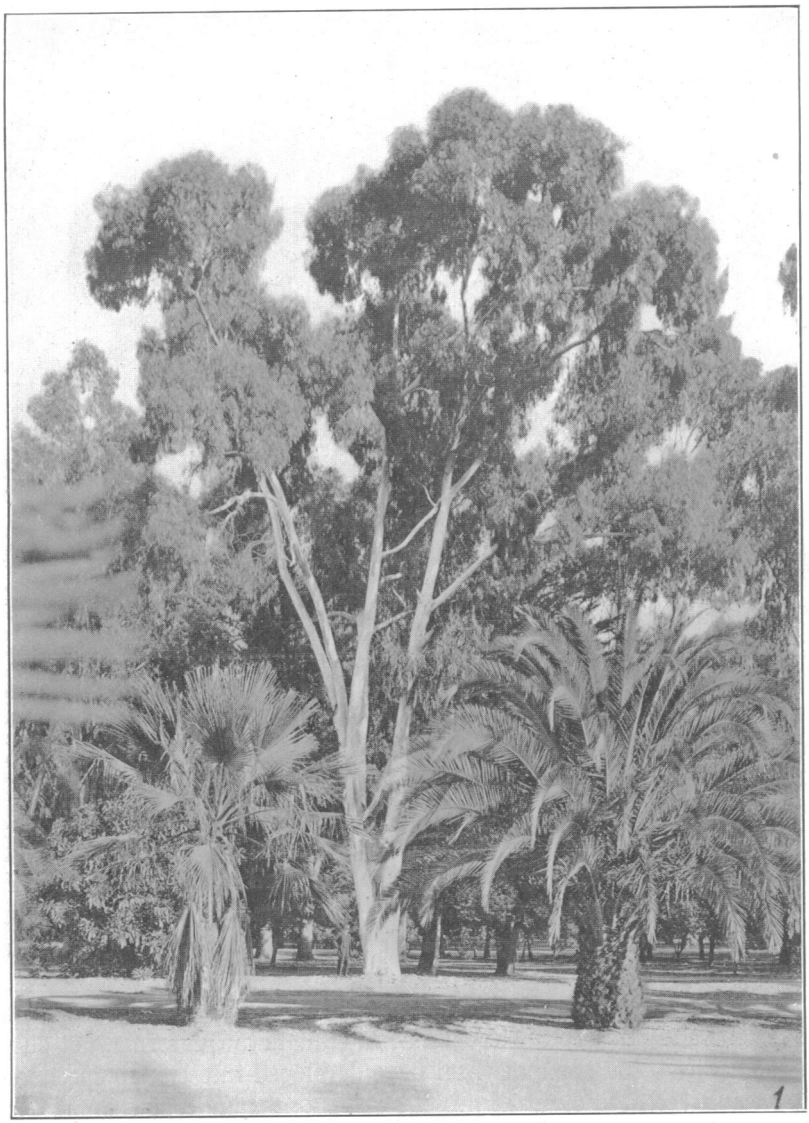

FIG. 1. A FINE SPECIMEN TREE, *Eucalyptus viminalis.*

really notable collection of native and exotic trees and shrubs will be assembled, and that students of horticulture and landscape gardening will find here an exceptional opportunity for studying the ornamental trees and shrubs that may be grown in this extraordinarily favorable locality.

Professor L. R. Abrams, who has consented to specially supervise the work, has already published[1] a brief statement of the plan which is proposed.

[1] *Science,* July 28, 1916, p. 128.

The first new plantings were made last spring, and it is expected that during the coming year substantial additions will be made to the existing collection.

Stanford University is situated on an estate of about 8,000 acres in the beautiful and fertile Santa Clara Valley, thirty miles south of San Francisco. Of this large area a considerable portion is still uncultivated, and furnishes excellent examples of the different plant formations characteristic of the region.

The topography is varied and picturesque, including parts of the level valley floor, but extending well into the foot hills of the Santa Cruz Mountains, which are 2,000 to 3,000 feet in height, and shelter the western side of the valley. The highest points on the Stanford estate are about 700 feet above San Francisco Bay. Much of the higher land is well wooded, and there may be found most of the trees and shrubs native to the valley—over sixty species have already been noted.

Recently the trustees of the university have set aside as botanical reserves a number of the most interesting tracts of wild land, selected by the department of botany. It is planned to retain these permanently as examples of the indigenous flora of the region.

With the varied topography is combined an equal variety in the geological formations, so that the number of species that grow naturally on the estate is very large, and there is an abundance of material for all lines of botanical investigation.

The climate of the valley differs a good deal from that of the bay region nearer San Francisco, as the mountains to the west shut off most of the fog which prevails in San Francisco during much of the year, and especially in summer; and the cold ocean winds lose much of their force in passing over thirty miles of land.

The mean annual temperature at Stanford University is between 55 and 60 degrees F., slightly higher than that of San Francisco; but the extremes are decidedly more marked. Thus during the summer the maxima are much higher than in San Francisco, but the minima decidedly lower. For example, when the maximum and minimum were 65–55 degrees in San Francisco, they would probably be about 80–50 degrees at Stanford. Freezing temperatures are extremely rare in San Francisco, while in the Santa Clara Valley, quite sharp frost early in the morning is a common phenomenon in midwinter. Freezing temperatures in the daytime, however, are never experienced, although before sunrise temperatures as low as 20 degrees have been recorded, and naturally tender plants suffer seriously, or may be killed when such cold occurs. In most winters, however, heliotrope, nasturtiums and similar tender plants escape without damage except in very exposed situations.

The summer months are normally quite rainless, and the total pre-

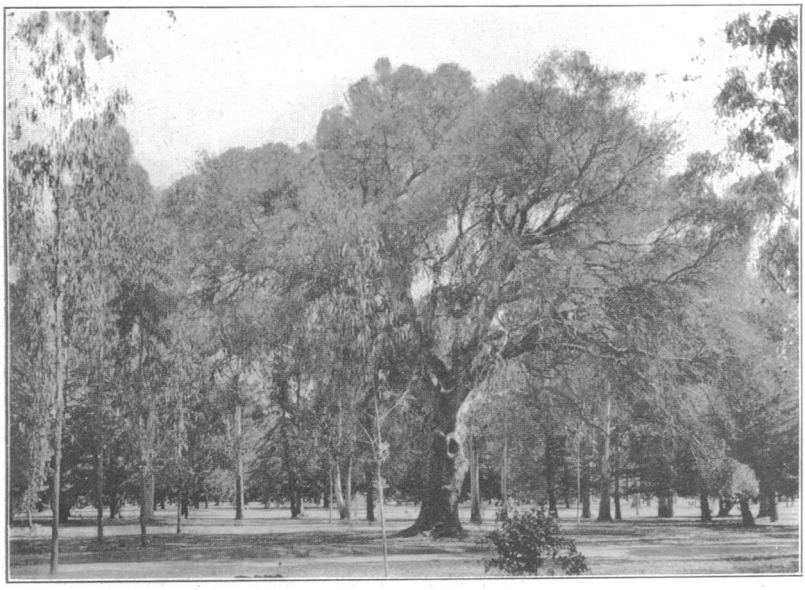

FIG. 2. CALIFORNIAN LIVE OAK, *Quercus agrifolia*.

cipitation (mostly from October to May) is seldom more than 20 inches, and usually less. In the foothill region, however, it is noticeably greater.

The lowest temperatures usually occur in December and January, when light frosts are quite common, but usually not sufficient to damage any but the tenderest plants. The usual winter maxima are 50 to 60 degrees, and the winter is a period of active growth.

The climate much resembles that of warmer parts of the Mediterranean region, and the same plants are met with. Olives, figs, vines and all of the "deciduous" fruits thrive, and the citrus fruits—oranges, lemons and grapefruit, are easily grown, but are seldom planted on a commercial scale. Palms of several species, including the native fan-palm (*Washingtonia*), are very commonly planted and the gardens are adorned with a great variety of evergreen trees and shrubs from various parts of the world.

The proximity of the ocean tempers remarkably the summer climate of the whole coast region, which offers a strong contrast to the intense heat and dryness of the central valleys and the southeastern part of the state. This temperate summer makes it possible to grow to great perfection most of the plants of northern Europe, which do not thrive in the hotter and drier parts of California.

It is evident then that climatically the conditions at Stanford are extremely favorable for the growth of a very large number of species;

and with irrigation, and slight winter protection, the number may be greatly increased.

The arboretum at present comprises about 200 acres, but in addition to this there are extensive plantations about the university buildings and the Stanford residence. These latter plantations include many unusually fine specimens of both native and exotic trees and shrubs.

As might be expected in California, so famous for its native coniferous trees, the Conifers constitute a conspicuous feature of the arbo-

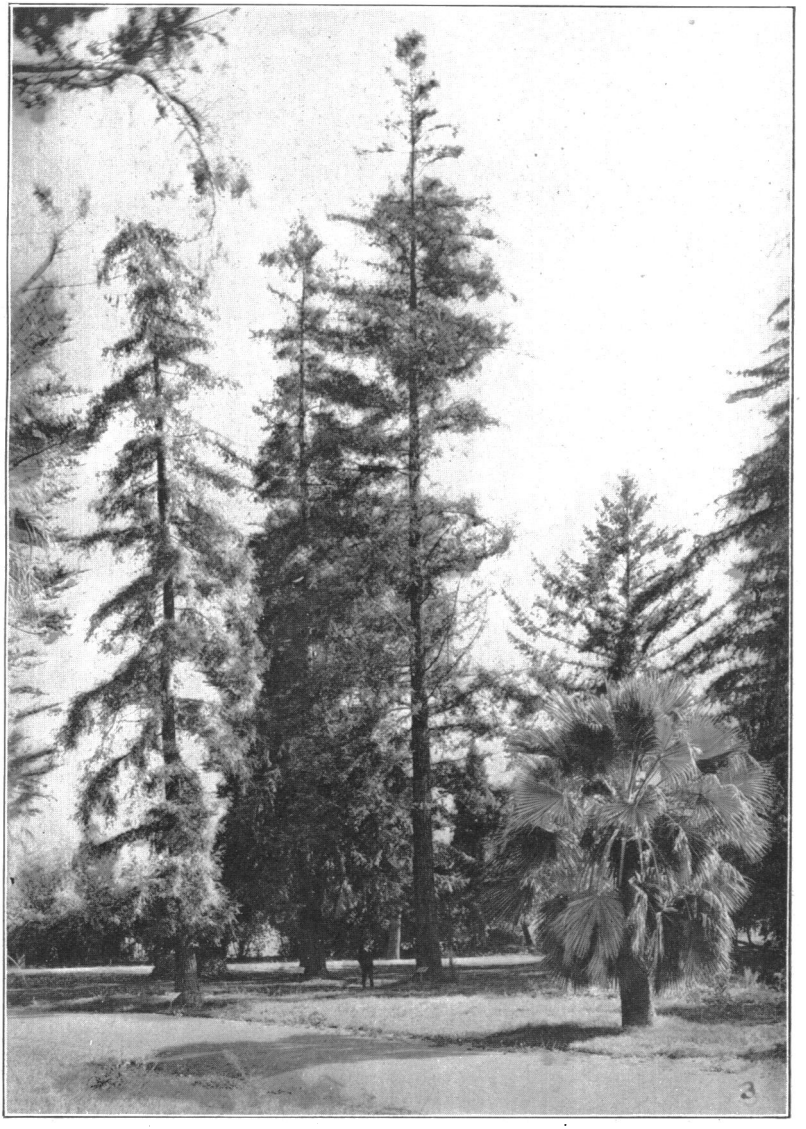

FIG. 3. REDWOODS PLANTED IN 1880. The taller tree is 110 feet in height.

retum. The two Sequoias, *S. gigantea* and the coast redwood, *S. sempervirens,* are represented by numerous specimens, including avenues of each species. The finest specimens, however, are trees near the Stanford residence, planted nearly forty years ago. The date of planting of these trees is recorded on tablets placed by them, and they afford a valuable record of the rate of growth of these trees under specially favorable conditions.

The most remarkable are two redwoods (Fig. 3) planted by President and Mrs. Hayes in 1880. The taller of the two is now 110 feet in height with a girth of 8 feet, 8 inches, at five feet elevation. The other, while not so tall, has a girth of exactly ten feet.

Most of the other characteristic genera of native Conifers: *Pinus, Abies, Thuja, Libocedrus, Cupressus, Torreya, Pseudotsuga,* are well represented by numerous examples. The Monterey pine (*Pinus radiata*) and Monterey cypress (*Cupressus macrocarpa*) are by far the most frequently planted.

The Eastern species of Conifers are not quite at home in California, and there is but a meager representation of these. The southern cypress (*Taxodium*) and the white pine, however, do fairly well.

Many exotic Conifers grow luxuriantly, and there is already an excellent collection. The oriental cedars (*Cedrus*) are well represented by numerous thrifty trees of all three species, *i. e.,* the cedar of Lebanon, the deodar, the Atlas cedar, all of which are very much at home. Several species of *Araucaria* represent this interesting section of Coniferæ, and various species of pines, firs, spruces, arbor vitæ, yews, Cryptomeria, etc., from different parts of the Old World, make the collection already established decidedly worth seeing, and it is expected that the number of these exotic Conifers will soon be materially increased.

Eucalypti of several species were freely planted when the arboretum was originally laid out, partly as a shelter for more delicate trees. These are now large trees and it will be necessary, from time to time, to remove a good many of them to make way for other trees. Some of these great *Eucalyptus* trees are magnificent specimens of their kind, and will be permanently retained, as they form one of the most striking features of the arboretum. The majority are the common blue gum (*E. globulus*), but there are many specimens of several other species, and in time the number of species of *Eucalyptus* will be much increased, as this characteristic Australian genus finds a most congenial home in California.

Among the native broad-leaved trees, the most abundant are the three common valley oaks, *Quercus lobata, Q. Douglasii* and *Q. agrifolia,* which are common everywhere in the neighborhood of the university. Other striking species are the Madroño (*Arbutus Menziesii*),

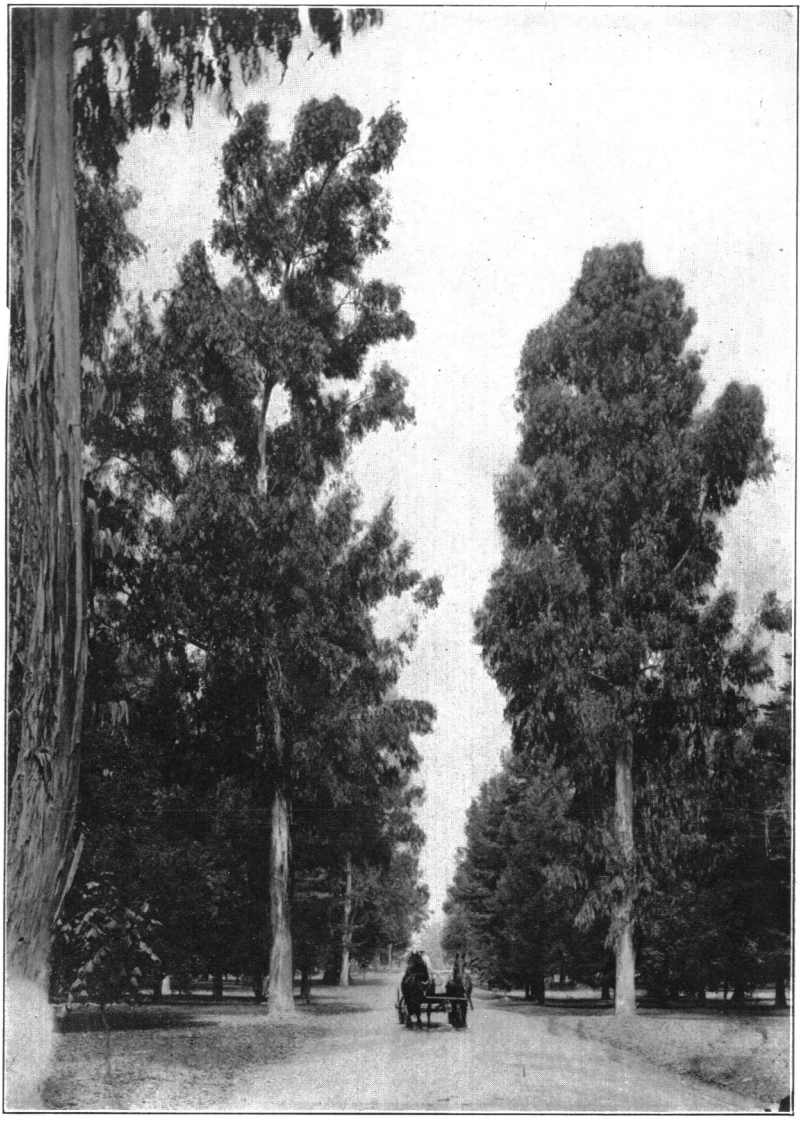

FIG. 4. AVENUE THROUGH THE ARBORETUM, SHOWING BLUE-GUMS, *Eucalyptus globulus*.

the bay (*Umbellularia Californica*), buckeye (*Æsculus Californica*), big-leaved maple (*Acer macrophyllum*). Other native trees and shrubs are freely planted, or grow spontaneously in and near the arboretum. Among the finest shrubs are species of manzanita (*Arctostaphylos*), "Toyon" or Christmas berry (*Heteromeles*) and several showy species of *Ribes*.

Aside from the Conifers already referred to, most of the exotic trees

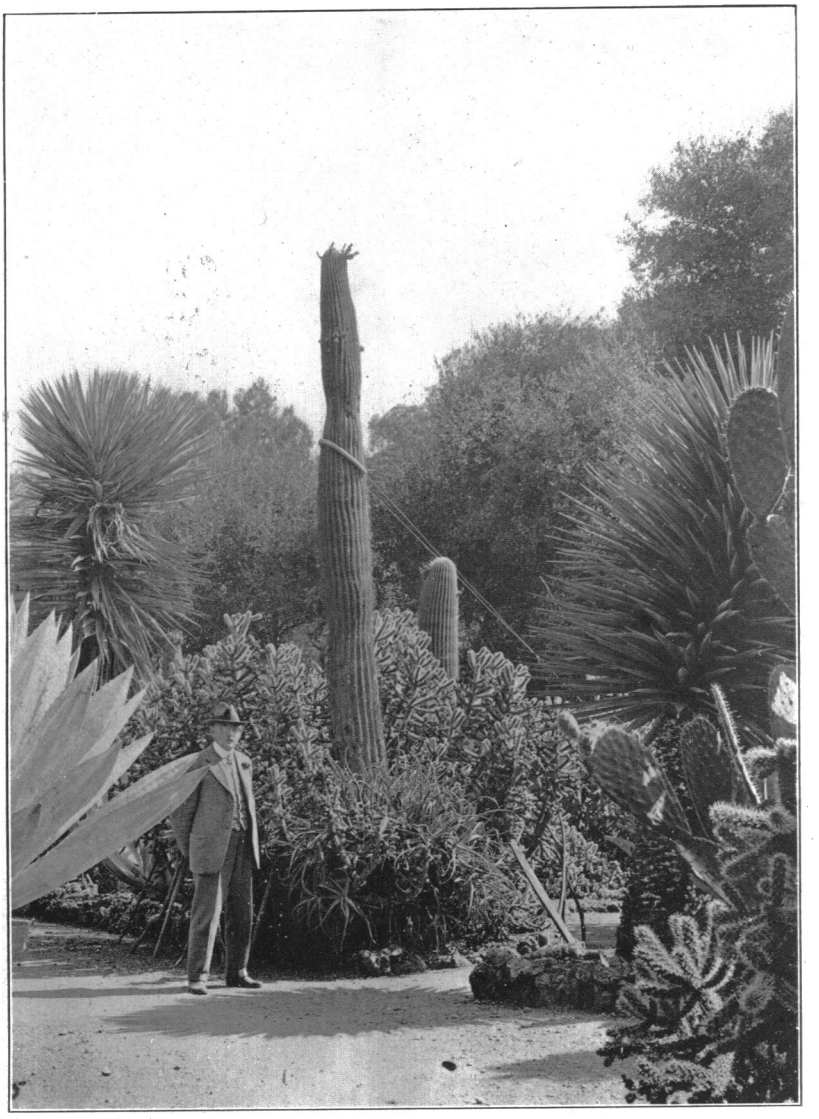

FIG. 5. IN THE "ARIZONA GARDEN."

and shrubs are unknown in the parks and gardens of the Atlantic States. A few, such as the European elms, ashes, horse-chestnuts, maples and sycamores are old friends, and a small number of species from the Atlantic States will be recognized, but for the most part, both trees and shrubs are strangers to the Eastern horticulturist. The Australian eucalypts, acacias, grevilleas, pittosporums and sterculias; the new Zealand veronicas, cordylines and coprosma; the Mediterranean myrtle, laurels, cistus, oleanders, brooms, etc., the pepper tree and other.

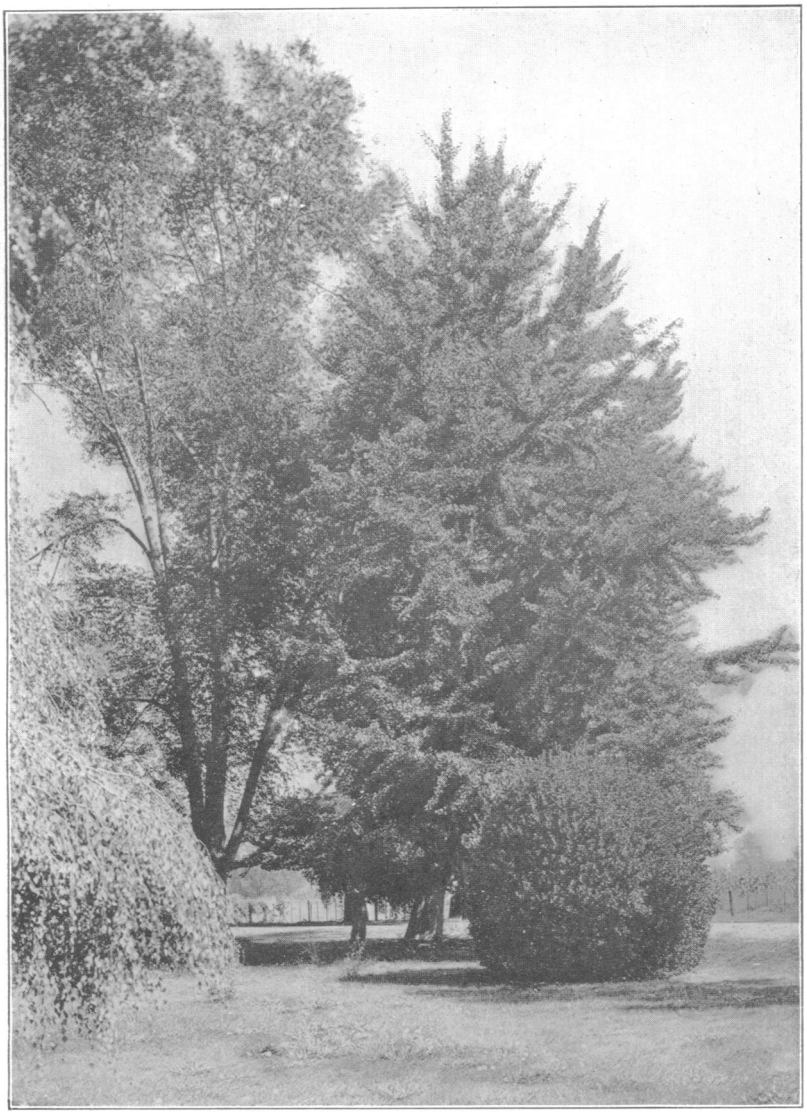

FIG. 6. MAIDENHAIR TREE, *Ginkgo biloba.*

unfamiliar South American contributions, with still others from South Africa and Mexico, give the arboretum a very different aspect from that of any similar collection in the Atlantic States.

The majority of these are evergreen and many are now trees of great size, which afford a splendid setting for future plantings. It will be necessary from time to time, as we have said, to remove some of the older trees to make room for new plantings, but this will be done as carefully as possible.

FIG. 7. PALM AVENUE.

Among the unusual features of the present arboretum is the "Arizona Garden," which contains very fine specimens of various xerophytic plants, especially cacti in considerable variety. Here may be seen fruiting specimens of the giant *Cereus* of Arizona, as well as huge plants of the common prickly pear, and other species of *Opuntia*. With these are associated various species of yucca, century plants, aloes, mesembryanthemum, and other characteristic plants of warm and arid countries.

The plans for the future development will have to be made somewhat gradually. As far as possible the species of the same family will be grouped together, but as the arboretum is part of the ornamental grounds of the university, it will be necessary to bear this in mind, and, so far as possible, to combine the scientific arrangement with the most advantageous landscape effects. Moreover, the cultivational needs of the different species must be taken into account. In a climate where for six months no rain may fall, the question of irrigation is an all-important one, and the water needs of the plants must largely control their position in the arboretum.

A special effort will be made to have as complete a collection as possible of the woody plants of California. The flora of the state comprises a very large number of extremely beautiful and interesting trees and shrubs, a fair number of which are already represented, but a much larger number of which are still to be planted. The many exotic species which thrive in California will, however, receive due attention.

The climate of most parts of California is not naturally adapted to the plants of Atlantic North America, as these need for their normal growth the hot humid summer of the East. The same conditions are necessary for most of the Japanese and Chinese species. If these are planted where they can be freely irrigated during the summer they grow luxuriantly, but few of them can endure the long dry summer without irrigation. When such trees as the American elm, white ash, or *Magnolia grandiflora* are planted in a lawn, which has to be frequently watered, they grow vigorously and soon form good-sized trees.

There are a great many species from the drier warm temperate regions of the world, which are very much at home in California, and which once established require very little attention. Thus many of the Australian eucalypts and acacias grow with amazing rapidity, and a long list of Australasian genera are abundantly represented in our Californian gardens and parks. The Mediterranean region furnishes a large assortment—laurels, evergreen oaks, carobs, heaths, cypresses, etc.—all of which do quite as well in California as on the Riviera. South Africa has its quota of beautiful shrubs and herbaceous plants, and the warm temperate countries of South America—Peru, Chile, Brazil and Argentina—have contributed a host of showy species, pepper trees, fuchsias, heliotrope, passion flowers, bignonias, bougainvillea, etc.

As in all of the warmer parts of California, palms are extensively grown, and although their growth is decidedly slower at Stanford than in Southern California, they nevertheless are very commonly planted,

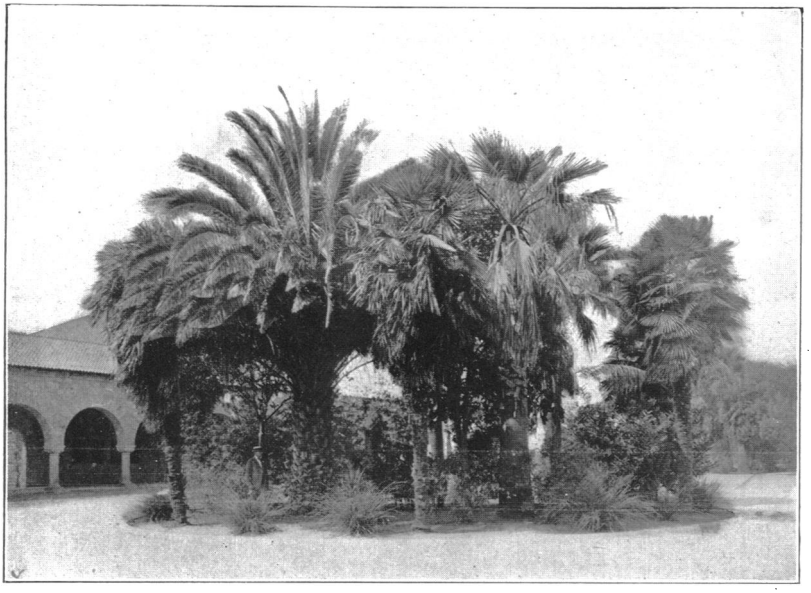

FIG. 8. GROUP OF PALMS IN THE QUADRANGLE.

and give a marked tropical touch to the landscape. On the university grounds at present there are grown some eight or ten species, and the palm avenue leading from the entrance of the estate and traversing the arboretum, a distance of nearly a mile, will attract the attention of the most casual visitor. There are some fine groups of palms, also, in the inner quadrangle of the university (Fig. 8). The arborescent yuccas, dracænas and cordylines are also freely planted in the university grounds.

It is therefore evident that there is a very wide field from which to select, comprising, probably, several thousand species which can be grown successfully in the arboretum as it is new being developed. Just how many, time will tell.

The writer is indebted to Professor L. L. Burlingame, of the department of botany of Stanford University, for the photographs used here as illustrations.